## Crysler, Ruby

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**Sent:** Wednesday, October 05, 2016 1:46 PM
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**Subject:** McConnell AFB PBR: RTC: SS544 (SWMU 207) Draft RFI Report
**Attachments:** McConnell SWMU 207 Report_Draft_RTCs_EPA_10032016.docx

**Categories:** Record Saved - Shared

Ruby,

URS/GSI responses to EPA's comments on the SS544 (SWMU 207) Draft RFI report are attached for your review and approval. If possible, please provide your approval on or before 14 October 2016. If this is not possible, please let us know when your approval may be received.

Thanks

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*3 October 2016*

**TECHNICAL REVIEW COMMENTS**
**McConnell AFB PBR**
**W9128F-13-C-022**
**Draft SWMU 207 (SS544) RCRA Facility Investigation Report**
**McConnell Air Force Base, Wichita, Kansas**
**March 2016**

| | | | |
|---|---|---|---|
| **Name:** | **Ruby Crysler, Environmental Scientist**<br>**Waste Remediation and Permitting Branch**<br>**Air and Waste Management Division** | **Phone Number: 913-551-7409** | |
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**General Comments:**

1. See Below

**Specific Comments:**

| Item | Section | Page | Para | Comment | A, D, E, or NFD | Response | A or D |
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| 1. | Executive Summary | ES-1 | 1 | **Executive Summary, page ES-1:** The first paragraph indicates Solid Waste Management Unit 207 is also designated as site SS544 within the USACE Installation Restoration Program. The paragraph further states that the purpose of the RCRA Facility Investigation is to characterize the nature and extent of releases of hazardous constituents initiating in the SWMU 207 area. Please clarify if the work is actually being performed under a USACE program and what is meant by "initiating."<br>**Groundwater Characterization -** The section states samples were analyzed for volatile organic compounds, biological and geochemical parameters and compound specific isotope analysis. There is no mention of sampling for hexavalent chromium. This should be briefly discussed in the section. | A | The areas of SWMU 207 and Site SS544 are equivalent. This RFI investigation is being conducted within the Air Force Installation Restoration Program, however the site has been historically referred to as SWMU 207 and continues to be addressed as such for the sake of continuity. "Initiating" means that hazardous constituents that were released from the SWMU No. 207 area due to historical activities being performed in that area. The report text will be corrected to reflect that the IRP is an Air Force program instead of a USACE program.<br>The requested text regarding hexavalent chromium will be added to the Groundwater Characterization section of the Executive Summary. | |
| 2. | 1.5 | 1-5 | 1 | **Section 1.5, page 1-5** (Hydrogeologic Setting): In the ***third sentence of the first paragraph of Section 1.5*** "and" should be changed to "which" in order to clarify that the low permeability deposits-not the sandier river deposits-have little transmitting capacity. The section should be revised accordingly. Additionally, in both the hard copy and PDF versions of the report, the text of ***Section 1.5*** is terminated mid-sentence at the bottom of ***Page 1-5.*** The rest of the ***Section 1.5*** text should be provided. | A | The requested changes to the text will be made. | |

A= agree D=disagree E = explanation NFD=needs further discussion

*3 October 2016*

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| 3. | 1.5; 3.2 | 1-5; 3-2 | 3 | **Section 1.5, page 1-5 (Hydrogeologic Setting); and Section 3.2, page 3-2 (Potentiometric Surface):** The third paragraph in **Section 1.5** indicates that slug testing in 2012 determined hydraulic conductivities between 1.7 x 10-4 and 2.0 x 10·2 centimeters per second (0.48 to 57 feet per day).<br><br>However, **Section 3.2** indicates that slug testing in 2015, which reportedly focused on the most transmissive portions of the paleochannel deposits, determined hydraulic conductivities from 6.9 x 10-4 to 6.2 x 10-3 cm/sec (1.9 to 18 ft/day). Because some hydraulic conductivities measured in 2012 are higher than those measured in the paleochannel deposits in 2015, comparative discussion of the 2012 and 2015 slug test data is warranted. The sections should be revised to discuss this. | A | The third paragraph of **Section 3.2** (page 3-2) will be amended to the following:<br><br>Past slug tests conducted in 2012 quantified hydraulic conductivity in the SWMU207 area. Testing was conducted at six wells, three of which were completed in what has now been identified as the Upper Transmissive Materials, and three of were completed in the Lower Paleochannel. The range of hydraulic conductivity calculated for the Upper Transmissive Materials in 2012 was from 0.1 to 56.7 ft/day. The range observed for the Lower Paleochannel was 1.6 to 11.6 ft /day.<br><br>The slug testing activities performed in 2015 as a part of this RFI were conducted at six locations, two of which were at wells screened in the Upper Transmissive Materials, and four of which were located in the Lower Paleochannel. The range of hydraulic conductivity calculated in 2015 for the Upper Transmissive Materials is from 7.5 to 17.6 ft/day. The range observed for the Lower Paleochannel is 2.0 to 10.9 ft /day. Results are summarized on **Table 3-2**, and complete slug test analysis is presented in **Appendix D**.<br><br>Strong correlation is seen between the 2012 and 2015 slug testing results, particularly in the Lower Paleochannel. The wide range of values observed in the Upper Transmissive Materials is consistent with the highly variable nature of this unit.<br><br>A column will be added to **Table 3-2** which presents the slug test results in units of feet/day. | |
| 4. | 2.2.2 | 2-4 | | **Section 2.2.2, page 2-4 (Monitoring Well Installation):** The first bullet on this page indicates that a 30-minute hydrostatic head test was performed to ensure a seal was created between the upper and lower water-bearing zones. Documentation of such tests was not included and should be provided in a revised report. | A | An **Appendix J,** including field notes developed during RFI field activities, will be added to the report. A statement that all wells passed hydrostatic head tests and a reference to **Appendix J** will be added to **Section 3.1**. | |

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| 5. | 2.2.3 | 2-5 | | **Section 2.2.3, page 2-5 (Groundwater Characterization- Hexavalent Chromium):** The second bullet on the page states four wells were sampled for hexavalent chromium (monitoring wells MW- 181, MW-51, MW-54 and MW-55D). The RFI work plan indicated samples from MW-44 would be sampled for hexavalent chromium. This apparent deviation from the work plan is not discussed in **Section 2.3.** Also, based on **Figure 2-1,** all of these wells appear to be located on the former Boeing property. An explanation must be provided for why samples were not collected from McConnell wells for hexavalent chromium. This sampling must performed in the future to determine whether this is a contaminant of potential concern at Solid Waste Management Unit 207. | E | A sample was collected from MW-44S for hexavalent chromium analysis, but was received beyond the required 24 hour hold time, as documented by Lab Report J68637-1 in **Appendix I**. In lieu of resampling MW-44S, hexavalent chromium analysis was performed at well MW-54, and, subsequently an additional sample was added at well location MW-55D. This deviation will be added to **Section 2.3** (See Comment 7). The determination of replacement sample locations was based upon choosing wells in the transmissive sands within the study area, not necessarily based on which property the well was located.<br><br>The four samples analyzed for hexavalent chromium are all located in the area of the boundary between MAFB and the Air Capitol Flight Line, which is an area with a limited investigation history. In the Data Gap Study performed by Tetra Tech in 2012, sampling was conducted for hexavalent chromium, including a total of thirteen wells, six of which were located on MAFB property. The highest concentration detected in 2012 was 2.46 ug/L at well SMWU207-MW40, and the highest concentration observed during this RFI investigation was 5.9 ug/L at SWMU207-MW51, both of which at significantly lower than the Tap Water RSL of for hexavalent chromium of 35 ug/L. | |
| 6. | 2.2.4 | 2-5 | | **Section 2.2.4, page 2-5 (Hydraulic Conductivity Testing):** The section states that hydraulic conductivity testing was conducted in accordance with project standard operating procedures; however, SOP 16, Hydraulic Conductivity Testing- Slug Test Method, is fairly generic in its approach. **Section 2.2.4** should be revised to specify the slug and transducer used, and associated field documentation should be included in a revised report.<br><br>Additionally, McConnell's response to the EPA comments, received March 10, 2015, indicated that the RFI report will include copies of the most current boring logs, well installation diagrams and well development records for monitoring wells undergoing slug testing. Although these records are available for the newly installed wells, they are not available for monitoring wells MW-178 and MW-180. This data should be provided in a revised document. | A | The requested revisions will be made to **Section 2.2.4**, and field notes of slug test activities will be included in **Appendix J**. Boring logs of historical wells will be added to **Appendix A**. | |

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| 7. | 2.3 | 2-7 | | **Section 2.3, page 2-7 (Deviations from Work Plan), and Table 3-1 (Groundwater Elevation Summary):** The last paragraph in the section states that 77 existing wells on McConnell and the Spirit and former Boeing properties were resurveyed because the surveyor found they were referenced to a different elevation benchmark. However, the section does not discuss the degree of difference between the new and old survey elevations, nor does it verify whether the new top of casing elevations are employed in creating the report figures (e.g., geologic cross-sections ***[Figures 3-2, 3-3, 3-10, 3-11]***, potentiometric surface map ***[Figure 3-6])***. Also, this section does not explain apparent deviations in well sampling (e.g., hexavalent chromium in MW-54 and MW-55 rather than MW-44, biological parameters sampling in MW-44 rather than MW-46, etc.). ***Section 2.3*** should be revised to include this information. | A | The following text will be added to the final paragraph of **Section 2.3:**<br><br>All new survey data is included as **Appendix E**, and the Top-of-Casing (TOC) elevations in **Table 3-1** reflect the updated elevations. All figures presented in this report reflect the most current survey data. Analysis comparing historic TOC elevations with the findings of the new survey indicated that, historically, wells on the MAFB property were reported an average of 0.1 foot higher than their correct elevations, and wells on the former Boeing and Spirit properties were historically reported an average 0.2 feet lower than their correct elevations. The usability of historical data is not expected to be impacted by this deviation.<br><br>See response to Comment #5 related to deviation in hexavalent chromium sampling.<br><br>The work plan proposed that biological parameters would be analyzed from MW-46 samples. Samples bottles for microbial analysis were unavailable during sampling of MW-46S, and insufficient recharge was available from MW-46D to collect the sample volume required. As a result, it was decided to collect the sample from the adjacent well MW-44. | |
| 8. | 3.2 | 3-2 | | **Section 3.2, page 3-2 (Potentiometric Surface); Table 3-2 (Aquifer Test Results); and Appendix A (Boring Logs and Monitoring Well As-Builts):** The section and ***Table 3-2*** present hydraulic conductivity results based on slug test analysis. However, several of the wells selected for slug test analysis are screened across multiple lithologies (see ***Appendix A***). For example, the MW-49D well screen intersects layers ranging from sand to clayey silt, and the SWMU207 MW-50D well screen intersects layers ranging from clayey sand to weathered shale. When a slug test interval spans multiple lithologies, "the slug test will yield an approximate thickness-weighted average of the hydraulic conductivities of the intersected layers" (Butler et al., 1994). ***Section 3.2*** and ***Table 3-2*** should be revised to discuss this averaging effect and identify slug test wells screened across multiple lithologies. | A | The following text will be added to **Section 3.2**:<br><br>The nature of both the Upper Transmissive Materials and the Lower Paleochannel are hydraulically conductive materials located within zones with little to no transmissivity, namely very stiff silty clay and/or hard shale. As noted in the boring logs in **Appendix A**, the transmissive materials are generally less than 10 feet in thickness, meaning that the screened interval of constructed monitoring wells typically span both the transmissive materials and a portion of non-transmissive materials. Because wells tested generally contain one type of transmissive material (i.e. poorly graded sand) the slug test results are presented with the assumption that the calculated hydraulic conductivity value is representative of the transmissive unit within the well's screened interval, and that the non transmissive portion is contributing a negligible amount of flow. One exception is SWMU207-MW49D, which consists of three different types of transmissive lithologies (Clayey Sand, Clayey Silt, and poorly graded Sand). Slug test results for this well returned a hydraulic conductivity value in the middle of the range of observed values as a result of the averaging effect of a screen which intersects multiple transmissive materials. | |

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| 9. | 3.3 | 3-3 | | **Section 3.3, page 3-3 (Soil Sampling Results), and Appendix A (Boring Logs and Monitoring Well As-Builts):** ***Section 3.3*** indicates that no soil samples were collected because no indications of chemical impact (photoionization detection or visual/olfactory evidence) were observed. However, because of this there is no data to confirm the absence of soil contamination, particularly in fine-grained soils where contamination might contribute to future back diffusion. From review of Appendix A, it appears that contamination was moderately indicated (e.g., SWMU207-MW49S: soil at approximately 17.4 feet below ground surface was wet and black but odorless, with photoionization detector readings above background). Given the use of a sonic drill rig and the absence of laboratory confirmation samples, PID calibration data and additional lines of evidence should be included in a revised report to verify the absence of soil contamination. | E | The following text will be included in **Section 3.3:**<br>PID readings ranging between 0.5 and 3.0 ppm were observed in one boring (SWMU207-MW49S), which were marginally above background and consistent across the full vertical interval of 0 to 65 feet below ground surface. The lack of correlation between the pattern of low readings and any physical structures such as the presence of saturated intervals, soil colors, or changes in grain size support that these readings are not indicative of any actual soil contamination. At the time of drilling, the field geologist interpreted the readings as background variability, most likely associated with moisture breakthrough of the moisture filter. Notes documenting PID calibration and background readings (reading from a dry, empty sample container) are included in **Appendix J**. | |
| 10. | 3.4.3 | 3-6 | | **Section 3.4.3, page 3-6 (Geochemical Parameters):** The second paragraph states four wells were sampled for hexavalent chromium. An explanation should be provided for why wells were selected from the former Boeing property only. See Comment 5. | E | See Comment Response 5. | |
| 11. | | | | **Table 3-1 (Groundwater Elevation Summary), and Appendix A (Boring Logs and Monitoring Well As-Builts):** Neither **Table 3-1** nor Appendix A provides boring or well construction information for previously installed monitoring wells. If available, boring logs and well construction diagrams for existing monitoring wells should be added to Appendix A, and screened interval elevations should be defined on **Table 3-1.** | A | The requested information will be added to **Appendix A** and **Table 3-1**. | |
| 12. | | | | **Tables 3-3 (Soil Analytical Results) and 3-4 (Groundwater Analytical Results- VOCs Analysis):** The tables screen data against the EPA Regional Levels, dated June 2015. This report is dated March 2016 and at the time of publication a more recent version of the RSL tables was available. Data must be screened against the most current RSLs available at the time the report is written. | A | **Tables 3-3** and **3-4** will be revised to reference the May 2016 EPA RSLs, which will be current as of the anticipated submittal date of the final report. There were no changes to screening levels between June 2015 and May 2016 for the COCs evaluated during this RFI, therefore there will be no changes (except to update the ARAR referenced). | |
| 13. | | | | **Table 3-5 (Groundwater Results- Geochemical Analysis):** The data in the table are presented in very small font. The table should be revised to provide data in a more legible format. | A | **Table 3-5** will be revised to provide data in a more legible format. | |
| 14. | | | | **Figure 3-2 (Geologic Cross-Section A-A' South-North Orientation), and Figure 3-10 (Trichloroethene Results Cross-Section A-A'):** Notes on both figures indicate that the boring logs for MW-178 and MW-179 were inadvertently reversed until 2015. Additional discussion is warranted in this report as to whether historical analytical results or water level measurements for MW-178 and MW-179 may have been reversed as well. | D | The construction details for MW-178 and MW-179 have been verified and the borings logs, analytical data, and groundwater elevation data presented in the RFI have been verified as correct. Because this well is owned by Boeing, the responsibility of reporting has been with Boeing and historical data has been collected by Boeing and its contractors. | |

A= agree D=disagree E = explanation NFD=needs further discussion

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| 15. | | | | **Figure 3-2 (Geologic Cross-Section A-A' South-North Orientation); Figure 3-3 (Geologic Cross-Section B-B' Northwest-Southeast Orientation); and Figure 3-4 (Upper Paleochannel Isopach Map):** Review of the geologic cross sections on **Figures 3-2** and **3-3** indicates upper paleochannel deposits are thin, discontinuous, and present at various elevations. However, the upper paleochannel isopach map on **Figure 3-4** suggests these deposits are continuous transmissive units. Additional discussion and lines of evidence are needed to support this stratigraphic interpretation. | A | The authors concur that the terminology of Upper Paleochannel was used to generally describe higher transmissivity materials within the surficial alluvium, and does not conform to the strict definition of a geologic paleochannel. The report text and figures will be amended to reflect the stricter definition of paleochannel, thereby eliminating references to an Upper Paleochannel, but instead will refer to these sand, gravels, and caliches as the Upper Transmissive Materials. As noted by the reviewer, these geologic materials are discontinuous in nature, certainly in their depositional histories, and highly variable in their spatial distribution.<br><br>The authors would contend that from a hydraulic point of view these materials provide the only significant groundwater flow pathway within the very poorly transmissive superficial alluvium, particularly in context of infiltration of surface water and recharge to the underlying Lower Paleochannel. While these units vary in thickness, are generally discontinuous, and are likely only connected by highly tortuous flow pathways, the flow of groundwater within the upper surficial alluvium will almost completely be determined by their distribution. For example, thicknesses of Upper Transmissive Materials over 5 feet in thickness are present at locations MW-53, MW-55, and MW-223, and will influence local shallow groundwater flow and infiltration in those areas. Analysis of the spatial distribution in the form of an isopach map allows for identification of areas potentially vulnerable to infiltration of surface water, and the authors believe **Figure 3-4** increases the reader's understanding of the site conceptual model.<br><br>**Section 3.1** will be revised to reflect this change in terminology and explain the differing natures of the Upper Transmissive Materials and the Lower Paleochannel Deposits. | |
| 16. | | | | **Figure 3-5 (Lower Paleochannel Isopach Map):** | | | |
| 17. | | | | a. **Figure 3-5** indicates that the thickness of lower paleochannel deposits at MW-49 is 11 feet. If this measurement is correct, the figure should be revised to show MW-49 within the 10-foot isopach. | A | **Figure 3-5** will be revised to show MW-49 within the 10-foot isopach. | |
| 18. | | | | b. The figure indicates that MW-35 was not installed to the depth of the lower paleochannel. In the absence of a measurement for this location, the 10-foot isopachs on either side of monitoring well MW-35 should be dashed rather than solid. | A | The requested revision will be made to **Figure 3-5.** | |
| 19. | | | | c. **Figure 3-5** shows the shale bedrock high but does not otherwise indicate the bedrock surface. A contour map of the bedrock surface should be provided for context when evaluating contaminant migration and accumulation. | A | A bedrock elevation map will be added to the report. | |

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| 20. | | | | **Figure 3-10 (Trichloroethene Results Cross-Section A-A'): Figure 3-10** shows TCE concentrated in the central portion of the aquifer, with concentrations decreasing to non-detect in the weathered shale. The deeper and more contaminated wells shown on the cross-section have screened intervals ranging from 20 to 50 feet that cross lithologies ranging from sand and gravel to clay and shale. Such screened intervals are not capable of isolating specific zones for plume delineation and may dilute the concentration of a highly contaminated unit or over-represent the contribution of a highly conductive unit (U.S. Geological Survey, 1997). Distribution of the TCE concentration within the aquifer is a significant remedial consideration, especially when variable lithology could contribute to matrix diffusion effects. To prevent misrepresentation of TCE plume distribution, the text and/or table notes should include discussion of additional lines of evidence or caveats pending further investigation. | A | The following text will be added to Section **3.4.2**, in the paragraph which introduces **Figure 3-10**:<br><br>It should be noted that within the areas of elevated concentrations, there exist various wells with screened intervals as long as 50 feet (MW-206), as noted on **Figure 3-10** and in **Table 3-1**. Although the effect of these longer screens might lead to an underestimation of maximum concentrations in these areas, these wells do not currently impact the horizontal delineation. | |
| 21. | | | | **Section 4.1, page 4-1 (Data Quality Assurance):** The section indicates there were no issues with equipment blanks or trip blanks and suggests that there were no issues with data quality control. From review of Appendix H, method and equipment blank contamination were detected. There were also instances of high surrogate recoveries, holding time exceedances and use of professional judgement to qualify data. The section should be revised to more accurately reflect quality control results. | A | **Section 4.1** discussed quality control measures as a whole, including all aspects of sample collection and data analysis. The report text states that there were no issues with CVOCs being detected in field equipment blanks or trip blanks, which is accurate. The specific issues mentioned by the reviewer, such as laboratory equipment blank detections, high surrogate recoveries, and method blank detections, are laboratory QAQC issues that, accordingly, are addressed in the Laboratory Data Validation **Appendix H**. In order to make the reader aware that minor issues were found in the Data Review, the following text will be added to Section 4.1:<br><br>While some minor laboratory QAQC issues were identified in the data review, these issues did not affect the usability of the data for its intended purpose. | |
| 22. | 5.2<br>5.3 | 5-1<br>5-2 | | **Section 5.2, page 5-l(Ramp 500); Section 5.3, page 5-2 (Ramp 400 Drainage Area); Section 7.1, pages 7-1 and 7-2 (Conclusions and Recommendations):** Some recommendations made in ***Section 5*** are not carried forward to ***Section 7.1.*** For example, ***Section 5.2*** indicates TCE in groundwater is not delineated to the EPA maximum contaminant levels downgradient of wells SWMU207-MW41D (71 micrograms per liter) and BH-03-03 (12 µg/L), and Section 5.3 indicates that recharge zones along a Ramp 400 drainage feature are not adequately characterized to assess surface water to groundwater migration. ***Section 7.1*** should be revised to incorporate all recommendations from previous sections of this report. | A | The requested changes will be made to **Section 7.1**. | |
| 23. | 6.1 | 6-1 | | **Section 6.1, page 6-1 (Receptors and Exposure Pathways):** ***Section 6.1*** eliminates exposure to residential receptors based on "planned future land use." An enforceable institutional control, consistent with the EPA guidance (2012), should be referenced in the RFI (i.e., reference that SWMU 207 is included in the Facility-wide Institutional Controls Implementation Plan). | A | **Section 6.1** will be revised to include the following:<br><br>SWMU 207 is included in the Facility-Wide Institutional Control Implementation Plan dated June 29, 2016, restricting the future land use of the site. | |

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| 24. | 6.1 | 6-1 | | **Section 6.1, page 6-1 (Receptors and Exposure Pathways):** The section states, "Based on current groundwater concentrations, surface conditions (predominantly paved and open-air), and the general absence of any structures (with the exception of the Control Tower), exposure via vapor intrusion or inhalation of CVOCs from groundwater at SWMU No. 207 is incomplete." The following issues are noted: | | | |
| 25. | | | | a. Although the Control Tower is not a residential building, the EPA has broad authority and distinct responsibilities to assess and, if warranted, mitigate vapor intrusion in non-residential settings arising from a chemical release that causes subsurface contamination by hazardous, vapor-forming chemicals (EPA, 2015a). The Control Tower is an occupied building and should not be excluded from vapor intrusion assessment. | D | The current Control Tower is in the process of being decommissioned. A new Tower, currently in the design phase, is being built which will incorporate an engineered vapor barrier in the foundation. Estimated completion date for the new tower is March 2019. For the current configuration of the control tower, all workers are located on the second floor of the building, limiting their exposure to the vapor intrusion pathway. | |
| 26. | | | | b. Although no shallow groundwater or soil gas sample has been collected near the Control Tower and no building configuration is available, current TCE concentrations in groundwater may pose a vapor intrusion concern to the Control Tower. Using the Vapor Intrusion Screening Level calculator (EPA, 2015b), an indoor air concentration of 7.43 micrograms per cubic meter is estimated based on a groundwater concentration of 26 µg/L (MW-179), a groundwater temperature of 18°C, and a commercial exposure scenario. The EPA Region 7 worker action level, based on potential fetal cardiac defects, is 6 µg/m$^3$ for an acute exposure of 8 hours. | D | If the "Exposure Scenario" in the VISL Calculator is changed to commercial and the generic attenuation factor for source medium of vapors for groundwater is changed to 0.0005 (from EPA's Vapor Intrusion Guidance, June 2015, for soils where groundwater is below fine-grained vadose zone soils, when laterally extensive layers are present) under Commercial in number 2 of the Notes, the 26 ug/L value has a carcinogenic risk of 1.2x10-6 and a hazard index of 0.42, both of which are within acceptable ranges. | |
| 27. | | | | c. Although the Control Tower appears to be the only occupied building within the SWMU 207 boundary, occupied buildings are present downgradient of SWMU 207 and are underlain by chlorinated volatile organic compound plumes of sufficient concentration to pose vapor intrusion concern.<br><br>Therefore, additional assessment of the vapor intrusion pathway, using multiple lines of evidence, is warranted at this site. | D | Response to comments #25 and #26 address the current Control Tower. The authors would agree that the contaminant plume associated with the former Boeing North Hangar warrant an assessment of the vapor intrusion pathway. However, based on the analysis described in **Section 5.3 and 5.4** of the RFI, this plume is related to former activities on that property and do not initiate from SWMU 207. Therefore the North Hangar will not be included in the SWMU 207 Baseline Risk Assessment. | |
| 28. | | | | **Appendix D (Slug Test Analysis):** The plots of normalized head data versus time for wells MW-49D, MW-50D, MW-178 and MW-180 are concave upward, a curvature that can make analysis by straight-line methods such as Bouwer and Rice (1976) ambiguous. Butler (1998) recommends matching Bouwer and Rice (1976) solutions to data within a normalized head range of 0.20 to 0.30 to minimize ambiguity associated with data curvature, and improve reliability of the data analysis. The employed slug test analysis software, AQTESOLV, is capable of superimposing recommended normalized head ranges on data plots to enhance visual curve matching. It is recommended that normalized head range be used or GSI should select an alternative analytical model appropriate for the formation and well installation. | D | The slug test analysis was performed using the Butler (1998) consideration of normalized head as described by the reviewer. The straight-line visual matching was performed over the normalized head range of 0.2 to 0.3, as is shown on the graphs included in **Appendix D**. However, as suggested by the reviewer, the normalized head ranges used for curve matching will be superimposed on the graphs in order to aid in review of the analysis. | |

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| 29. | | | | **References**<br>Butler, J.J. Jr., G.C. Bohling, Z. Hyder, C.D. McElwee. 1994. "The Use of Slug Tests to Describe Vertical Variations in Hydraulic Conductivity." *Journal of Hydrology*. 156: 1-4. April.<br>Butler, J.J. Jr., 1998. *The Design, Performance, and Analysis of Slug Tests*. CRC Press, Boca Raton, FL.<br>U.S. Environmental Protection Agency. 1991.<br>EPA. 2012. "Institutional Controls: A Guide to Planning, Implementing, Maintaining, and Enforcing Institutional Controls at Contaminated Sites." OSWER 9355.0-89. EPA-540-R-09-001.<br>EPA. 2015a. "OSWER Technical Guide for Assessing and Mitigating the Vapor Intrusion Pathway from Subsurface Vapor Sources to Indoor Air." Office of Solid Waste and Emergency Response, Washington, D.C. OSWER Publication 9200.2-154. June.<br>EPA. 2015b. "OSWER Vapor Intrusion Screening Level (VISL) Calculator." Version 3.4. November 2015 RSLs.<br>U.S. Geological Survey. 1997. "Guidelines and Standard Procedures for Studies of Ground-Water Quality: Selection and Installation of Wells, and Supporting Documentation." Water Resources Investigations Report 96-4233. | | These references are understood to substantiate the comments made by EPA in this document, as opposed to additional references to be added to the Reference section of the RFI. | |

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